OMICRON-II MICROCOMPUTER IN APPLICATION AS WEB THERMOMETER

Ing. Ferdinand HODÁŇ, Doctoral Degree Programme (1)
Dept. of Biomedical Engineering, FEEC, BUT
E-mail: xhodan00@stud.feec.vutbr.cz

Supervised by: Dr. Jiří Rozman

ABSTRACT

This paper deals with the description of OMICRON-II microcomputer board in application as Web Thermometer. OMICRON-II Web Thermometer is an interface which can connect 4 binary inputs and outputs and various temperature sensors to an Ethernet network. The values can be accessed using HTTP (WWW and XML pages). The temperature sensors can be connected using the RS-232, RS-485 bus or 1-wire connection.

1 INTRODUCTION

Omicron-II is a small board microcomputer included powerful Rabbit Semiconductor's RMC3360 CoreModule with Dynamic C 9 language support. The RCM3360 microprocessor core module presents a new form of embedded flexibility with removable xD-Picture Cards [1]. Supporting on-board 16 MB NAND Flash as well as memory cards of up to 128 MB are ideal for large data applications requiring low-power operation. The OMICRON-II board is well suited for a wide range of applications.

Other areas of use are:

- Networked sensors
- Remote monitoring equipment
- Alarm service providing
- Remote diagnose and service
- Industrial Ethernet applications
- Home and building control

2 MICROCOMPUTER BASIC CHARACTERISTICS

Omicron-II is a small (88 x 110 mm) board microcomputer included Rabbit Semiconductor's RMC3360 CoreModule with Rabbit 3000 and SMSC's LAN91C113

Ethernet controller [1].

2.1 MICROCOMPUTER FEATURES

The main features are:

- Rabbit 3000 microprocessor with up to 55 MHz clock speed
- Full duplex IEEE 802.3 compliant 10 / 100 Mbps Ethernet controller with on board RJ-45 connector
- Six serial ports, (on board mounted RS-232 at DB-9 & Cannon-9 connector and half duplex RS-485 at screw terminal)
- 512 kByte in-system programmable FLASH, 16 MB NAND FLASH and 128 MB xD-Picture Cards
- 512 kByte SRAM and 512 kByte FAST SRAM
- 56 programmable digital I/O lines
- Ten 8-bit timers/counters and 10-bit timer/counter
- Watchdog with 17-bit timer for enhanced reliability
- LED indicators for power supply and Ethernet activity
- Single power supply DC 8÷12 V

2.2 MICROCOMPUTER BLOCK DIAGRAM

The block diagram (fig.1) shows the main components. Definitely the most important part is the Rabbit 3000 microprocessor. It's a powerful chip described in detail in Rabbit's Rabbit 3000 data sheet [1]. Almost all pins are routed to the OMICRON-II expansion port, 64-pin connector which can be used to join other hardware. This board may contain simple I/O circuits driven by the OMICRON-II board or may be equipped with their own processor using the OMICRON-II board as an Ethernet I/O processor only. The microprocessor provides 6 serial ports, three of them are routed to the onboard RS-232 and RS-485 level shifters. OMICRON-II provides an on-board modular RJ-45 connector for its twisted pair Ethernet port. This port is connected to the SMSC LAN91C113 Ethernet controller via 10/100Base-T transformer/filter. The interface supports the maximum cable length of 100 meters between the microcomputer board and hub. The complete logic of the OMICRON-II board is driven by 5 V and 3.3 V power supply. The board provides its own voltage regulators. It only requires an unregulated power supply of 7÷24 V with a minimum current of 500 mA.

3 SOFTWARE

Control program for microcomputer has been written and debugged in design environment Dynamic C 9 supported by Zilog Inc. company [2].

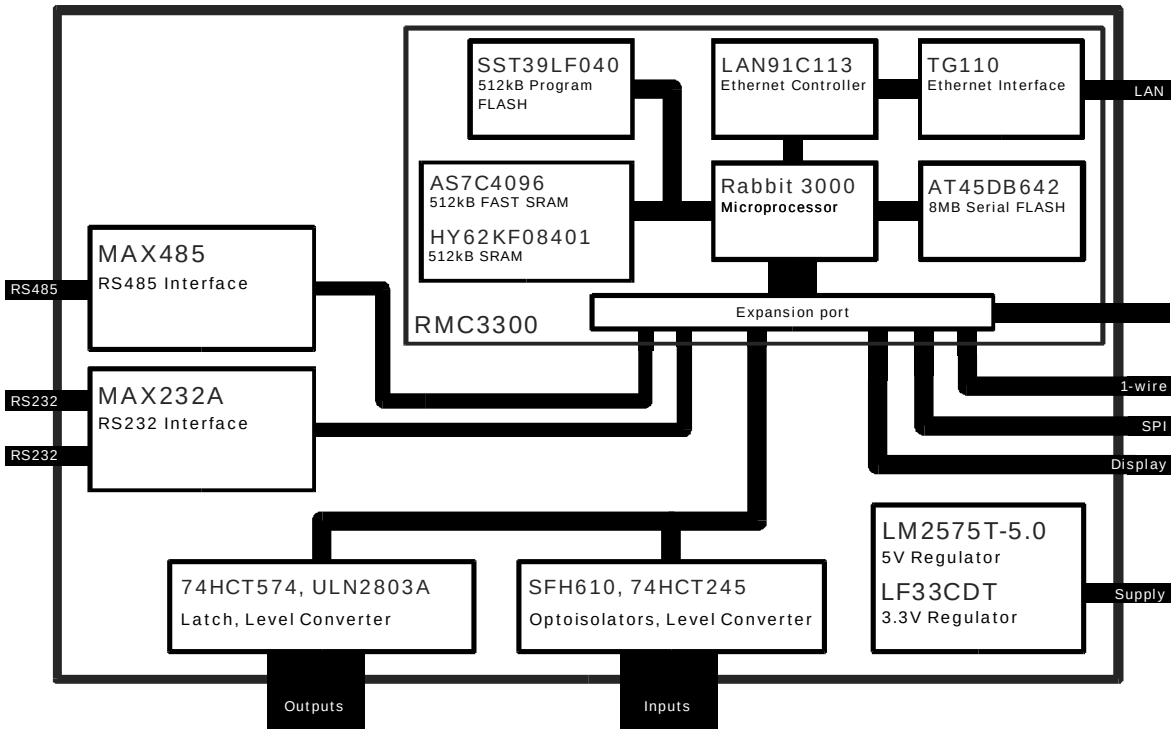

Fig. 1: *OMICRON-II block diagram*

Dynamic C 9 development system contains a C-language environment that includes an editor, compiler, and in-circuit debugger [2]. Efficient hardware and software integration facilitates rapid design and development. User programs can be compiled, executed, and debugged using Dynamic C and a programming cable-no in-circuit emulator is required. An extensive library of drivers and sample programs is provided, along with royalty-free TCP/IP stack with source. The Real-Time Kernel called MicroC/OS-II; created by Jean J. Labrosse is included in this program [3]. MicroC/OS-II is a preemptive, prioritized kernel that allows 63 different tasks, flags, semaphores, mutex semaphores, queues, and message mail boxes. Thermometer Web pages has been written in HTML language. Interactive content of web pages eg. drawing of measured temperature relations, has been created using JavaApplets and JavaScripts.

4 MICROCOMPUTER CONSTRUCTION

The RabbitCore RMC3360 is mounted on an own-designed motherboard and acts as the controlling microprocessor for the Web Thermometer system. Designed printed circuit boards are displayed on fig. 2. The equipment is finally situated in compact metal box.

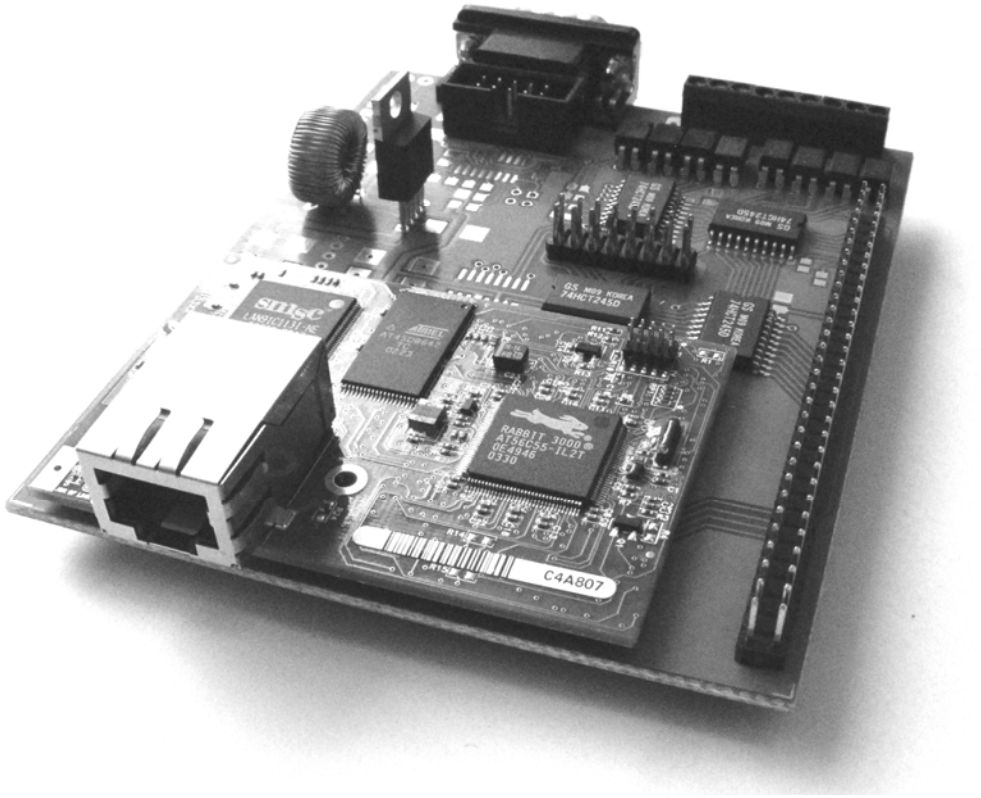

Fig. 2: *Omicron-II*

5 CONCLUSION

Web Thermometer was developed for remote monitoring and long term measurement of temperature with statistic and graphic outputs of measured data. As the external precise digital temperature sensors are attachable, this equipment can be used in the laboratory of ultrasound technique by the measuring of thermal effects of ultrasound. The application of the microcomputer as Web Thermometer is only one of many other possible variants to them the microcomputer can be used.

ACKNOWLEDGEMENTS

The work was supported by the research programme of Brno University of Technology No. J22/98-2622 00011 - „Research of Electronic Communication System and Technologies“.

REFERENCES

[1] RabbitCore RMC3700 User’s Manual, U.S.A., Z-World Inc. 2004, 019-0136

[2] Dynamic C User’s Manual, U.S.A., Z-World Inc. 2004, 019-0125-C

[3] Labrose, J.: MicroC/OS-II, The Real-Time Kernel, San Francisco, CMP Books 2002, ISBN 1-57820-103-9